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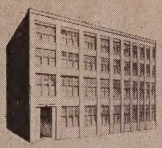

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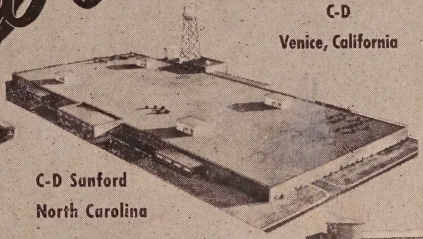

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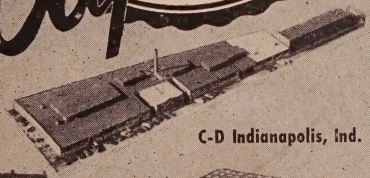

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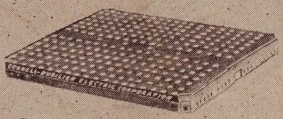

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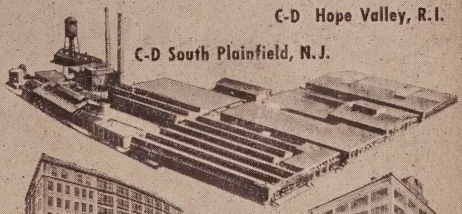

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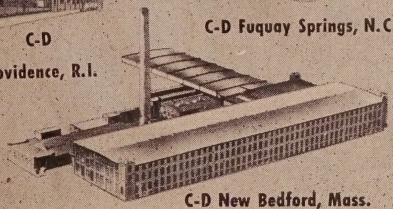

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Vol. 21 AUGUST, 1956 No. 8

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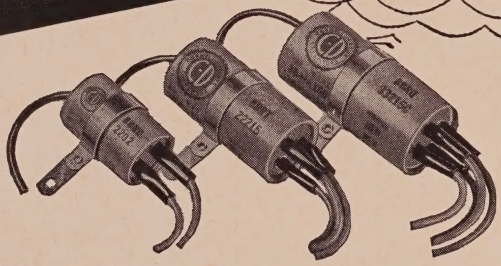

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GUARD CIRCUITS

Electrical measuring circuits are subject to the misleading and deleterious effects of stray parameters. To insure accuracy of measurement, these effects must either be eliminated in the test setup or taken into consideration in computation and evaluation of test results.

It is the purpose of guard circuits to remove or reduce the effect of strays. These circuits are auxiliary to the main test circuit and take different forms depending upon the type of measurement and the parameter involved. It is entirely possible that a guard circuit might be devised for any measurement circuit subject to the effect of extraneous factors.

Many guard circuits and guard techniques originate within specific laboratories in response to a peculiar need and are never described outside of their immediate environment. Other such circuits, however, are standard and are in the public domain, although their examination may be neglected by the student.

Resistance Measurement

In the measurement of very high resistance, trouble is experienced with surface leakage on the test sample. This shows up in the testing of insulation resistance (dielectric linkage) and in the measurement of high-value resistors (resistances of the order of several hundred to several thousand megohms).

A typical resistance-checking setup is shown in Figure 1. Here, the dielectric sample, in the form of a flat plate or parallel-faced block, is provided with surface electrodes and is connected in series with a source of emf (usually 0.5 to several kv) and a suitable high resistance measuring instrument, such as a Megger, megohmmeter, or megohm bridge. The d-c leakage component of interest is indicated by the solid, current arrows shown passing directly through the bulk of the dielectric. This is the true electronic or ionic transport indicative of the dielectric leakage.

In addition to this component, however, there also is a current leaking along the surface of the dielectric from one electrode to the other and indicated in the Figure by the dotted arrows. This component, being in parallel with the bulk current component, tends to make the dielectric resistance appear lower than its true value.

The effect of the surface leakage current may be counteracted by means of a small-area, closely-spaced guard electrode surrounding the main elec-

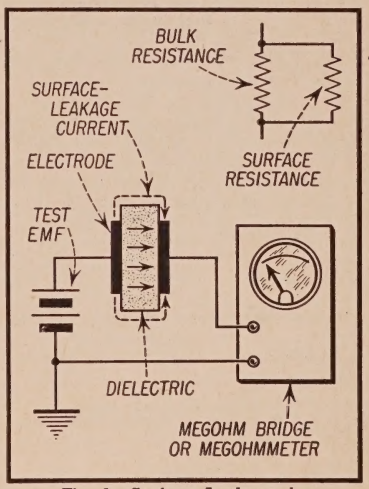

Fig. 1. Surface Leakage in Dielectric Testing.

trode on each face of the dielectric. This is shown in Figure 2. The cross section in Figure 2(A) shows how a narrow guard ring is placed concentric to the main electrode on each dielectric face. Figure 2(B) shows the appearance of one electroded face. While circular electrodes are shown in the Figure, it seems entirely feasible that rectangular electrodes also might be employed where necessary.

This guarded arrangement permits the surface leakage currents to pass directly to ground and thus exert very

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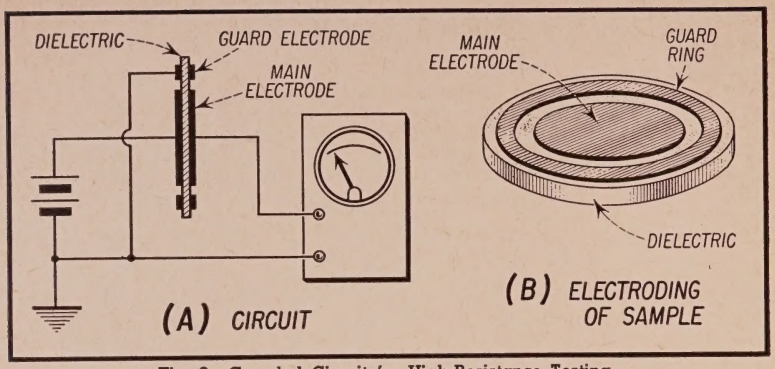


Fig. 2. Guarded Circuit for High-Resistance Testing.

little, if any, influence on the deflection of the test instrument.

A variation of this same technique is employed in measurement of the insulation resistance of shielded cables. In this test, surface leakage often is a problem, especially when the test emf is several kilovolts. Figure 3 shows how guard rings may be provided on each end of the test-cable sample for immediate grounding of the leakage currents.

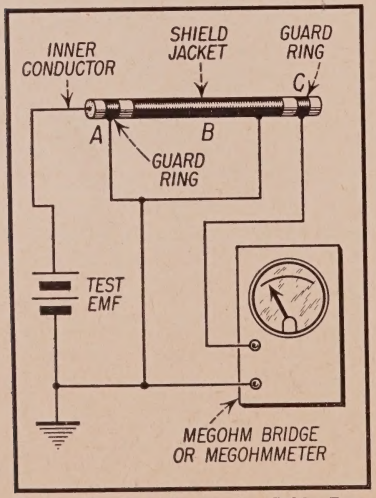


Fig. 3. Guarded Circuit for Cable Test.

Here, a portion of the shield jacket (B) is cut away at each end to leave a pair of rings (A and C) and the latter are grounded. The separation between the main jacket and the rings should be as small as practicable. When the test-cable sample is not of the shielded type, sections A, B, and C may be obtained by winding metal foil or closewound wire tightly around the insulating jacket of the cable. The insulation resistance of dielectric-jacketed wire thus may be checked in this manner.

A high-megohm resistor may be guarded in a similar manner to counteract the effects of surface leakage. These resistors are supplied in the range of several hundred to several thousand megohms, and surface leakage can be significant when checking their resistance. This is especially true when the measuring voltage is very high.

Figure 4 shows how rings of wire may be attached to the outside body of the resistor to serve as guard rings for the immediate grounding of the surface leakage component.

Similar guard devices may be devised for the accurate testing of any component in which dielectric leakage must be determined. The same principle may be applied easily to a wide variety of shapes and configurations of bodies.

Capacitance Measurement

Capacitance measurement, as such, has direct importance in electronics and electricity. In other industries, capacitance - measuring techniques and gear are utilized in the measurement of other parameters than capacitance. Certain other changes are reduced to capacitance changes. A few of these are: (1) power factor of oils and other non-conducting substances, (2) fuel level or water level in tanks, (3) minute variations in an air gap or in the thickness of a material, metallic or non-metallic, (4) temperature, pressure, or humidity changes, and (5) measurement of surface roughness. In either case, the correct value of capacitance is required when its absolute magnitude is needed for computations or in design.

When the capacitance of interest is small (i.e., of the order of a few micro-microfarads), the effects of all stray capacitances, either at the point of connection or within the test circuit, can be consequential. This is especially true when neither terminal of the test capacitor can be grounded.

The capacitor under test, or used as a transducer, is connected to some pair of input terminals, such as A and B in Figure 5. When neither terminal of the capacitor can be grounded, each of these terminals exhibits a capacitance to ground (C_Y and C_Z in Figure 5A) or to a ground shield (C_S in Figure 5B).

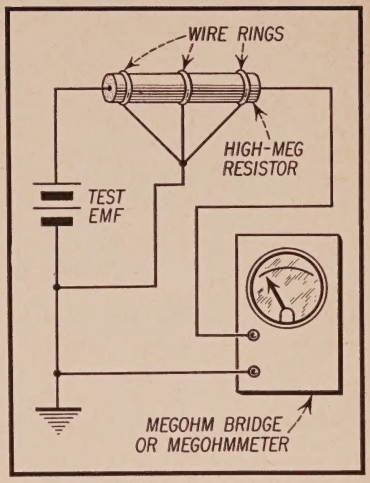


Fig. 4. Guarded Circuit for Hi-R Resistor Test.

When using a conventional capacitance bridge for the measurement of the value of C_x, the direct capacitance will not be indicated accurately by the balanced bridge because C_y and C_z shunt the bridge arms. In order to eliminate this effect and remove the error it introduces, an auxiliary guard circuit is provided for the bridge. This circuit must be separately balanced with respect to the extraneous capacitances, and its adjustment inter-

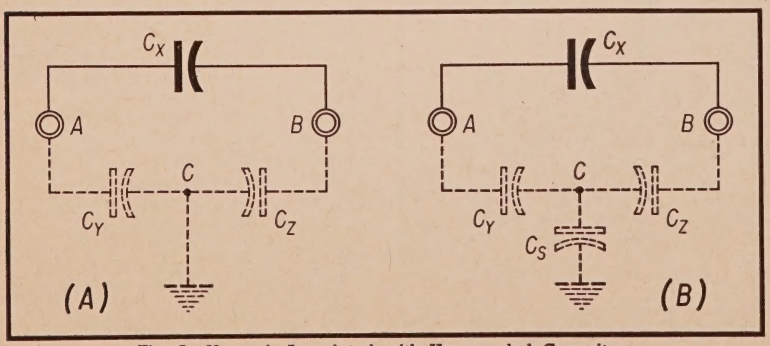


Fig. 5. Network Associated with Ungrounded Capacitor.

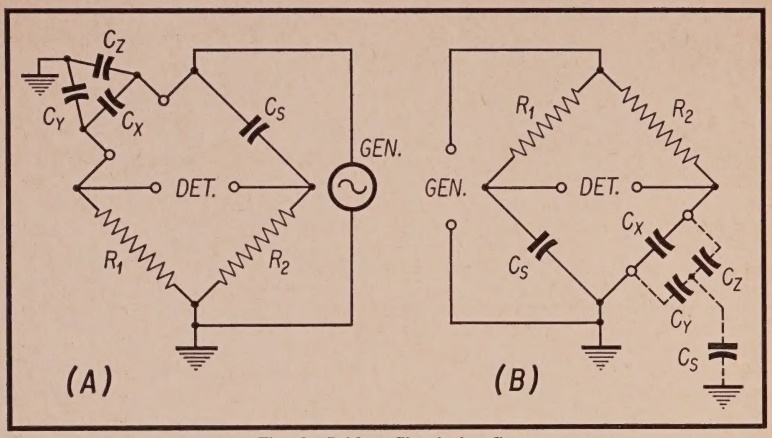


Fig. 6. Bridge Circuit for C_x.

acts with that of the bridge. At complete null (that is, both bridge and guard circuit are balanced), the bridge indicates the true value of C_x.

Figure 6 shows the condition resulting when the small test capacitor, C_x, is connected to a conventional capacitance bridge. Note that the terminal capacitances, C_y and C_z, are effective in the bridge circuit. Figure 6(A) shows the condition obtained with the capacitor network shown in Figure 5(A), and Figure 6(B) corresponds to the network of Figure 5(B).

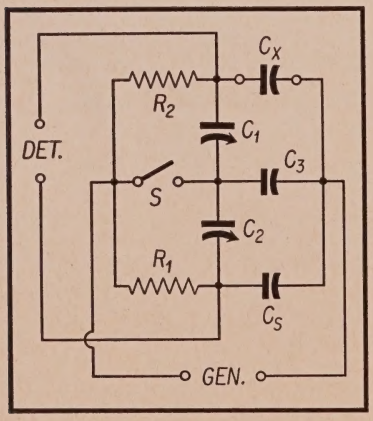


Fig. 7. Capacitance Bridge with Guard Circuit.

Figure 7 illustrates the addition of a guard circuit (C_1–C_2–C_3–S) to the capacitance bridge for correction of the terminal-capacitance effect. Capacitance C_1 corresponds to stray C_z in Figure 6(B), C_2 to C_s, and C_3 to C_y. In operation, the bridge first is balanced, by adjustment of R_1 and R_2, with C_x in place and with switch S open. The switch then is closed and null re-established by adjustment of C_1 and C_2 in the guard circuit. Next, S is opened and the bridge rebalanced with R_1 and R_2. Switch S then is closed, and the bridge nulled by adjustment of C_1 and C_3. When a point in the two adjustments is reached at which the bridge remains balanced in both positions of switch S (opened or closed), the bridge indicates the true value of the direct capacitance, C_x.

Figure 8 shows the placement of the main and guard electrodes on a disc or plate of dielectric material for bridge measurements of capacitance and power factor. This type of measurement is made very often to determine dielectric constant and dissipation factor values. The gap between the

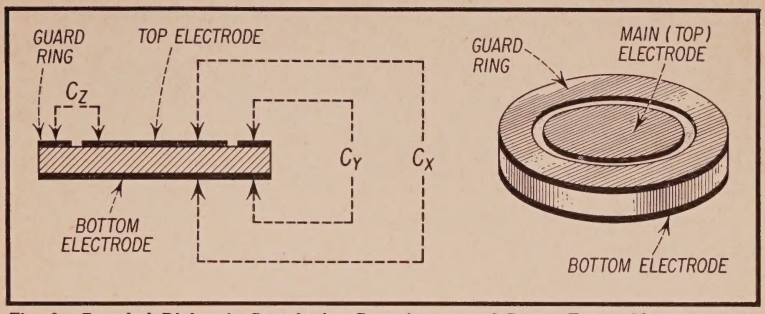


Fig. 8. Guarded Dielectric Sample for Capacitance and Power Factor Measurements.

top electrode and guard ring is kept very small.

This style of electroding provides a 3-terminal capacitor which may be substituted directly in the circuits of Figures 6 and 7. The capacitance between the main top and bottom electrodes corresponds to the direct capacitance, C_x (Figures 6 and 7), the guard ring-to-bottom electrode capacitance to C_y, and the ring-to-top electrode capacitance to C_z.

Pressed-on electrodes usually are unsatisfactory. Electrodes of the type shown in Figure 8 often must be formed by firing silver on the dielectric material. In many instances, the material will not withstand the high firing temperatures. With these materials, the metal may be plated on the dielectric by evaporation, but the vacuum deposition equipment often is not available, especially in small laboratories. Figure 9 shows a scheme which has been employed with some success in various quarters. Here, the plate of dielectric material is floated on the surface of mercury which serves as the bottom electrode. Two concentric, insulating rings are placed on the top of the material. Mercury is poured into the inner ring to form the top main electrode, and between the two outer rings to form the guard electrode. Wires dipped into the three mercury pools provide connections to the measuring circuit.

It should be noted that guard electrodes are advantageous even in the simplest testing of the capacitance of a dilelectric sample. When a pair of electrodes is installed on the faces of a dielectric plate or film, the "fringing" of electrostatic lines of force at the edges can, under some circumstances, introduce appreciable error in the measurement. Guard rings of the sort just described act to minimize or eliminate this error.

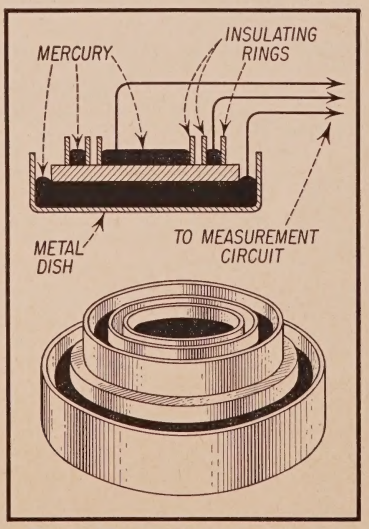
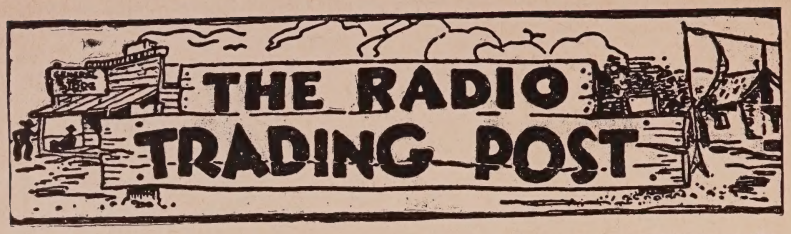


Fig. 9. Mercury-Electrode, Guarded Dielectric Sample Holder.



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WANT — Turner TV-1 or TV-2 booster for cash or will trade radio equip. State price and cond. Michael Bocskay, 20028 33rd Ave. NE, Seattle, Wash.

WANTED — 16x50 or 20x50 binoculars, soldering gun, BC-221. James Littig, Kasota, Minn.

WANTED — Contact to exchange by tape recording ideas in electronics and general interests, living in Cocoa, Fla., area. Tape speeds 3¾ - 7½ IPS. Dual track. John O. Hehn, 18 So. Jardin, Shenandoah, Pa.

WANTED — Tuner for RCA 8T241 TV; roteo detector coil for Raytheon TV 7DX21. No tubes or chassis. Clifford D. Lessig, Riegel Rd., RD 1, Milford, N. J.

WANTED — Car radio for 1953 Nash Statesman for cash or Feiler stethoscope like new. Let us dicker. C. J. Reinisch, Box 259, Miller Place, N. Y.

SELL OR SWAP — Radio Specialities 3-element, 20-meter short beam in good cond. Make offer. Want mobile or photo equip., tape recorder, Hi-Fi amplifier. W. E. Percel, 2315 Caledonia St., Toledo 5, Ohio.

WANTED — Record changer; 16 mm movie projector fan-cooled; 25 or 30 w. driver units of P.M. type with horns; Bogen 75 w. amplifier model PA-75. Have test equip. to swap and cash. John Arnold, Box 84, Bluffs 3, Ill.

SWAP — Sams Photofacts for sig. tracer or condenser checker. A. Everett, 98 Kingston Ave., Brooklyn 13, N. Y.

SELL OR TRADE — Hi-voltage and hi-wattage resistors, 10 ohm 100 w., 6 meg. 5000 v. and others. A. H. Clarke, Jr., c/o Clarke's Lakeside Motel, Rt. 1, Houghton Lake, Mich.

WANT — Sylvania aluminum tube caddy. for cash. Have for sale TV booster, 6J6, $5; Anchor 2-stage $10; Meissner 8C FM tuner, $20. All postpaid. Jack's TV, Bedford, Iowa.

FOR SALE — Eldico novice code and theory course, includes 5 code records (33 1/3 rpm) plus theory lessons, $15. Rett Oren, 324 Highwood Ave., Leonia, N. J.

WANTED — Test equip. Have TV sets, 10" to 20". Troch's, 290 Main St., Spotswood, N. J.

FOR SALE — Meissner EX signal shifter late model, perf. cond., TVI'd; Viking II transmitter. Sell separately, best offer. Richard Geisler, 6 West King Street, Littlestown, Pa.

WANTED — Used Sprague Kwik Test K-1 condenser checker, must be in perf. cond. Kred Kloepper, 649 West 23rd St., Lawrence, Kan.

WANTED — Small electronic or bellows type organ for cash or trade rifles, cameras, projectors, elec. test equip. S. S. Lynn, 2741 East 28 St., Brooklyn 35, N. Y.

WANTED — FM tuner, coax spkr, preamp, speaker enclosure, Heath VTVM, Heath audio oscillator. State price. Theodore Nadeje, 5101-AA 39th Ave., Sunnyside 4, N. Y.

TRADE — Unused surplus tubes, test equip., for Heathkit AT-1 transmitter or other ham gear. S. Consalvo, 4905 Roanne Dr., Washington 21, D. C.

FOR SALE — Electronic-Designs VTVM, with instrs, test leads, $30; Simpson 260, $30; Eico 425K, $40; Simpson 276 calibrator, $20; Philco 200X UHF conv., $25. J. Pellock, Benld, Ill.

FOR SALE — 12½" Emerson 644 table model TV, 23 tubes, standard coil tuner, perf., $14.95. Will ship. Jones Radio, 1115 Rambler Ave., Pottstown, Pa.

FOR SALE — 5FP4 CR tubes in good cond.; LM freq. meter in steel carrying case, with 115 v. AC reg. power pack, l. n., $99.50 FOB. Llvle Roderick, 1204 Sierra Vista, Alhambra, Calif.

FOR SALE — Conant instrument rectifier type B, unused, $1. Albert C. Hart, 207 North Raymond St., Griffith, Ind.

SELL OR TRADE — Raytheon xformers UX9117A 840 vct., 110 ma.; 530 vct., 21 ma.; 5 v. 3 a.; 5 v. 3 a.; 6.3 v. 1 a. Cash or swap for audio equip. Gerry Gelber, 522 So. 19th St., Newark 3, N. J.

FOR SALE — Portable radios: Emerson 558 with tubes 1R5, 1S5, 1T4, and 3S4, battery only, $5 COD; Clarion 11011 3-way with tubes 1R5, 1T4, 1S5, 3Q4, $5.50 COD; both exc. cond. V. Kozma, 12450 NW 5th Ave., Miami 50, Fla.

WANTED — Complete comb. PA system for outdoor mobile unit. State price, cond., and age; also Aerovox model 76 capacity and resistance bridge, cheap. Bob's Radio and TV Service, Box 37, Wabasso, Fla.

FOR SALE — Heath AT-1 xmitter, like new, $25; Johnson Viking VFO, $25. John Rogers, 502 Ridge Rd., Elmont, N. Y.

WANTED — Lo-pass filter with 70 mc. cut-off for 6-meter amateur band operation, prefer home brew built from ARRL Handbook. Will pay cash or swap. Lee Singleterry, 1914 Ballinger Rd., Seattle, Wash.

WANTED — 1954 Chevy. custom radio, need not be in working cond. Ben W. Mueller, RFD 2, No. Tonawanda, N. Y.

FOR SALE — Complete radio-TV service repair shop, fully equipped, also sales of records, appliances, grossed $25,000 last year. Owner now in govt. activity. Best offer. Stuart R. Hyams, 1336 Kimberly Dr., Philadelphia 31, Pa.

FOR SALE — Hallicrafter S76 short-wave rcvr, double conversion, exc. cond., $100. Local only. Herbert Spilger, 1001 Anderson Ave., Bronx 52, N. Y.

FOR SALE — Complete 8-tube Mopar in carton, unused, for 1955 DeSoto. M. T. Burkott, 9991 Albion Rd., North Royalton, Ohio.

TRADE — Comet motor scooter (needs minor repairs) and Whizzer knee-action front forks for Hallicrafters S-38 rcvr. Send for photo of scooter. Olen Sellers, 2317 Ave. "R", Birmingham 8, Ala.

FOR SALE — Micro-vox wireless mike, slightly used, $3.50; RCA auto. record changer, 78 rpm, as is, $4.50 plus postage; used tubes .30 each. R. M. Massey, 423 Monroe St., Philadelphia 47, Pa.

SELL OR TRADE — 75 w. fone Harvey-Wells T-90 mobile or fixed, 110 AC, 12 v. DC, carbon mike, all cables, $160; Hickok 195B scope with manual. Want CE20A. Lt. W. C. Thomas, BTU-4 NAAS, Corry Field, Pensacola, Fla.

FOR SALE — British walkie-talkie Mark III, manual and tubes, 6-9 mc. mike, ear phones, $15; Elect. Design VTVM, $20; McMurdo - Silver 909 sweep gen., $10; 772 Weston analyzer, $10. Walt Zinsmeister, 146 N. 16th St., Bloomfield, N. J.

FOR SALE — Two tape recorders: Pentron HF400 Emperor with VU-meter, 3 spkrs, 10 w. amp.; Wilcox-Gay push-button model 5A. Make offer. M. Towers, Box 155, Philadelphia 5, Pa.

SELL OR TRADE — Stancor 203A 30 w. mobile xmtr. with tubes, xtals, and meter, $35; two 723A/B Klystron (10,000 mc.) and 725-A cavity magnetron. Frank Scaglione, 111 Stuyvesant Ave., Jersey City 6, N. J.

FOR SALE — Back copies Radio Electronics, Radio-TV News, and aircraft manuals. Louis Porsetsky, 137-16-169 St., Jamaica 34, N. Y.

WANTED — Electrical appliance repair course or books; also radio-TV service books. Must be priced right, in good cond. Walter Fralick, R. 1, Marion, Ky.

SELL OR TRADE — Eico 425K 5" scope, unused, $45, or latest model tube tester sig. tracer, eliminator, VT voltmeter, sig. gen., Hickok 530 tube checker. Sam Berenblum, 417 Greenwich Ave., Greenwich, Conn.

SELL OR TRADE — Meissner sig. shifter-VFO; 110 v. AC xformers 300 to 500 v. DC, 200 to 300 mils output. Louis Cinci, 204 Charter St., Clarksburg, W. Va.

WANTED — Model 21WP4 picture tube for Philco model 51-PT1207 TV set. State price and condition. Oscar Crafton, Box 268, Belleville, Ill.

WANTED For Cash — Eico or Heathkit batt. eliminator, and oscilloscope, any cond.; Harvey-Wells power supply for aircraft xmitter, model AT-3 B-6, Serial 77. Will pay top price. Philip L. Koch, 3534 Connecticut St., St. Louis 18, Mo.

SWAP — Photo equip.: Solar enlarger meter, press camera, expos. meter, speed printer, etc. Want Hi-Fi and test equip. John Cordes, 21 Milford St., Brooklyn 8, N. Y.

FOR SALE — Complete file Popular Science, Jan. '23 thru Dec. '55. No skips, no missing pages, file notations only. Best cash offer or what? F. J. Kane, 9722 Aurora Ave., Seattle 3, Wash.

WANTED — Rider's 11, 12, 13, 15 and 16 in good condition. State price FOB Des Moines. Ben I. Guise, 2503 61st St., Des Moines, Iowa.

SELL OR SWAP — Sprague Tel-O-Mike resistor, condenser analyzer TO-3, Eico 1040 batt. eliminator, for tape recorder. Fred Rusek, 374 Dawson St., New Bedford, Mass.

WANTED — Radio tubes, type: Wunderlich "A", dual grid, 2.5 v. fil. 1A, vintage of 1930. State price. W. Adams, 68-77 218th St., Bayside 64, N. Y.

FOR SALE — Heathkit model BT-1 A and B dry batt. tester, like new, money order, $4.25. E. Giroux, 735 Park Avenue, Hoboken, N. J.

SELL OR TRADE — Precision E-400 and E-200-C; RCA TV-127, 12½" table model; Hallicrafters TV, T-54. Want Hickok test equip. or Precise unassembled kit 300K or 308K. Robert W. Peters, 3603 Lincoln Way, West, Massillon, Ohio.

SELL OR SWAP — 8 mm movie camera, projector, film splicer and Weston light meter. Karl Muck, RD 2, Warsaw, N. Y.

WANTED — Generator, 300 w., 110 v. AC, 60 cy., or equivalent, World War I type accepted, for cash. Theodore Nelcey, Riverside, Conn.

SELL OR SWAP — 3000 v. ct 600 ma. xformer; Stancor P6166 xformer; 2-829B's; 2-10 MFD 1000 v. filters; Simpson 100 ua meter and 0-150 v. AC meter; Philco 2" scope. Howard Cohen, 1975 83rd St., Brooklyn, N. Y.

SELL OR TRADE — 10" wood lathe with motor stand; 12" bed extension, complete set of chisels; cylinder type Edison Victrola; 5½" blacksmith vise, for 110 v., 60 cy., light plant or field strength meter. G. L. Shriver, Sr., Rt. 1, Ridgeley, W. Va.

SWAP — Alexander Hamilton business course, complete, for good used comm. receiver plus other engineering textbooks. Lee Benson, Jr., 116 Croftley Rd., Towson 4, Md.

SELL OR TRADE — Heath 5" scope, model 0-6, A-1 cond.; Wilcox-Gay radio and disc recorder; AM-FM tuner; Eico 1050 batt. eliminator, 6 and 12 volts, factory wired. Jack Fives, 2916 Rockrose Ave., Baltimore 15, Md.

FOR SALE — Hallicrafter civic patrol radio, model S-81, 152-174 mc. FM band, good cond., $30. Hy. Knoller, 1590 E. 22nd St., Brooklyn 10, N. Y.

FOR SALE — National NC-46, 500 kc., 30 mc., band spread, BFO, with matching spkr, exc. cond., $35; BC-348-R receiver with xtal filter, internal 110 AC supply, modified audio output, good working cond., $45. Eugene Adams, 755 Delafield Ave., Staten Island 10, N. Y.

FOR SALE — McMurdo 900 VTVM with RF probe, $20; VHF 152A with 6BZ6 RF, hand calibrated on 10 meters, $40; Drake 587 audio bandpass filter, l.n., $8. M. Weinberg, 987 East 178th St., New York 60, N. Y.

SELL OR SWAP — Car radios. W. C. Burgoyne, 2 Pickett St., Marblehead, Mass.

FOR SALE — Bud CPO-128, like new; ART 13 speech amp.; S38B completely reconditioned; 75 and 40 meter mobile xmtr.; receiving and xmtg. tubes. W. Buffington, Jr., 5208 Birkenhead Road, Jacksonville, Fla.

WANTED — To buy or borrow instruction book for Heathkit 0-6 oscilloscope, push-pull extended range. Jacob De Fonso, 624 Reynolds St., New Castle, Pa.

SWAP — Transvision TV sweep marker generator, 2-277 mc., A-1 cond., for ham equip. of comparable value. Howard Keller, 92 Ridge Terr., Neptune City, N. J.

WANT — Auto radio for '50 Plymouth, prefer custom set including dash mounting, i.e., model 807 or 604 for cash or trade. R. Kopp, 311 Hamilton Avenue, Silver Spring, Md.

SELL OR TRADE — Arkay AM-FM tuner, wired and aligned, plus Mils Hi-Fi all triode 2A3 push-pull amp., $45. Need Hi-Fi 12" speaker and good 4-pole record changer. Ben Cardamone, 773 East 8 St., Brooklyn 30, N. Y.

WANTED — Circuit diagram Western Air Patrol receiver, model 829-49975 (Western Auto Supply). Clem Rumin, Box 453, Merced, Calif.

FOR SALE — Like new: Precision test-master 1054; Superior VOM 670A; Superior CRT tester TV40; ART eliminator, 6-12 v., 20 amp.; vibrator tester. Thomas Byrne, 331 Calhoun Ave., Bronx 65, N. Y.

FOR SALE — Back issues of Radio-TV News and Radio Electronics, almost all from 1952, $8 money order. Will ship Railway Express. Elwood J. Luck, 57 East Buttonwood Ave., Pine Hill, N. J.

SELL OR TRADE — Precision 920 multi-meter and tube tester; QST's in binders 1926 - 1955; unconverted BC-696 and BC-459 on dual mtg. rack. Want ARRL handbooks. Carl A. McKay, 4144 Meda Pass, Fort Wayne 6, Ind.

WANTED — Hams in Frisco Bay area, to buy or sell clean used ham gear and TV test equip. Syd's Electronic Exchange, 11243 No. Hiway 9, Cupertino, Calif.

WANT — Conversion-modification plans for BC-348-R rather than trade for original or modified BC-348-Q which will have to do. Nelson Rau, 1509 Dewey Ave., Northampton, Pa.

WANTED — Army tech. manuals TM1166 and TM1167. Cash or trade DeVry Institute courses. Dean Davis, 108E Island City Homes, Galveston, Tex.

FOR SALE — Heath FM-2 tuner, wired, good working order, $15. Charles DeSimone, 262 North 6th St., Brooklyn 11, N. Y.

WANTED — Premier model 117 xtal controlled Mini sig.. gen. Must be clean with xtals, manuals, test leads. A. H. Glines, 46 Winter St., Quincy 69, Mass.

FOR SALE — Unused Globe Scout 65-A, $100 prepaid; R-28/ARC5 VHF receiver, unconverted, $10; Merit A-3104 15 w. universal mod. xformer, imp. 2,000 to 20,000, $4. L. M. McGee, Herington, Kans.

FOR SALE — Precision cathode ray tube tester CR-30, l. n., $50; Heathkit condenser checker, assembled and tested, ready to go, $20. Don Y. Yen, 343 Lewis St., Rockford, Mich.

SWAP — 1938 Buick 4-door sedan with 5 like new 6-ply tires and tubes, for amateur rcvr, xmitter, scope, or TV test equip. L. J. Schnedorf, 610 Monroe Ave., River Forest, Ill.

SELL OR SWAP — 1939 RCA console radio, with Golden Throat sound, magic eye, 3 bands, very good cond. Best offer, or what have you? Harry G. Leslie, 210 Parkside Ave., Brooklyn 26, N. Y.

FOR SALE — K & E polyphase slide rule model N4053; 96 various tubes, unused. Make offer. Charles H. Schulz, Jr., 5602 Belle Vista Ave., Baltimore 6, Md.

FOR SALE — 16" overhead recording lathe; 12" GI recording TT (78 & 33 1/3); 16" pickup; new sapphire recording stylus; 25 10" red-label audio discs, $60 Curley's Radio Service, 3714 East Dakota Ave., Fresno, Calif.

FOR SALE — Hallicrafters S-47, no spkr, $35; 1955 Chev. radios, a Motorola and a GM, 1955 Chrysler radio, $25 apiece; Pentron CT-1 tape recorder, unused, $75. John H. Oxrieder, 5018 Elm St., Bethesda 14, Md.

SWAP — Hunting and fishing gear, VTVM, camera, tube checker, and blond wood TV cabinet. All or part, depending on value, for tape player or recorder. A. Consiglio, 4615 Furman Ave., Bronx 70, N. Y.

FOR SALE — Like new UHF converter, Ch. 14-83, max. 330 w.; Perma-Power TV tube; Britener, used; Alliance booster, used. Hill Radio-TV Service, 1409 Gurley Ave., Waco, Tex.

WANTED — At best price, Hallicrafters SX-25 receiver. Bill Burton, 1728 Peach Ave., Memphis 12, Tenn.

WANTED — Three-speed record changer in cabinet with speaker, for cash or trade. G. H. Swiska, 109 East School St., Woonsocket, R. I.

WANTED — Schematic for Jefferson Travis model 350 AT. O. H. Sain, Box 49, Fort Mill, S. C.

FOR SALE — Heath O-8 scope, $20. Want 3" proj. unit. Earl Aasheim, Enderlin, N. Dak.

FOR SALE — Radio testers; radio and elec. books, manuals, diagrams, service sheets. Write for particulars. Watt's Radio Service, RD 1, Poultney, Vt.

FOR SALE — Triplett 3434 TV and FM sweep sig. gen. with built-in markers, $89.50 plus shipping. H. M. Love, 4993 Grace Rd., North Olmsted, Ohio.

SWAP — Sams folders Vols. 2 and 10, exc. cond., or wiring diagrams, parts list and service info on Philco radios from 1928-1936, for Sams folders 4, 5, 6, 9, 11, 13-29. Irwin Kanner, 1951 Elston St., Philadelphia 38, Pa.

SELL OR TRADE — Superior CA-12 sig. tracer (less battery), $15 or what have you? Prefer local. R. F. Wolf, 4446 W. 148th St., Midlothian, Ill.

WANTED — Edison cylinder phonograph and cylinder records, especially records. L. H. Francis, 401 Main St., Parkville, Mo.

SELL OR TRADE — Jackson 648 dynamic plate conductance tube tester, orig. cost $99.50, will sell for $40 or trade for reasonable offer in mint U. S. or Canadian stamps. Kenneth S. Rhoda, 1676 Seymour Ave., Utica 3, N. Y.

SELL OR TRADE — Wilcox-Gay recordette, $35; GI recorder assembly, $12.50; GI recorder, phono, radio, PA, $40; Hi-Fi V.M. 3-speed phono. Grey Mather, 722 Charlotte, Utica, N. Y.

WANTED — RCA KW modulation xformer; Japanese mike A1WA-M18. E. L. Felder, Tylertown, Miss.

FOR SALE — Oak Ridge 104 syncro-sweep gen.; PE-103, as is, $5; Electrox 6 v. batt. eliminator; Motorola manual and automatic control heads. Hopper's Radio and TV Shop, 301 Hollis St., Framingham, Mass.

FOR SALE — 75 w., 6-band CW xmtr., built from '55 handbook, has 5763 and 6146, cost $47 to build, best offer. Interested in mobile outfit. M. A. Jason, 539 Oxford St., Auburn, Mass.

FOR SALE — Excellent 11-tube Hallicrafters AM-FM chassis with 12" speaker, $45; 7" Hallicrafters TV, $39; RCA 1" scope, needs CRT and binding post, $10. Need good used Varityper and glass ignitron. Armond W. Behm, Lomira, Wis.

WANTED — To contact anyone interested in corresponding by tape. Would like to form tape correspondence club. Those interested reply by letter or tape, 1⅞, 3¾, or 7½ ips. Len Dworkin, 1845 Andrews Ave., New York 53, N. Y.

FOR SALE — Two-station wireless Intercom, $42; Phaostron VOM, like new, $32; 25 w. Bogen amplifier, $25. Collier, 190 Yoder, South Bend 14, Ind.

FOR SALE — Dynamotor 440 v. AC, 60 cy., 3 phase input, output 87.5 v. DC @ 350 ma. and 300 v. DC @ 1.2 amps., $50. S. S. Brody, 211-10 73rd Avenue, Flushing 64, N. Y.

WANTED — Old player piano music rolls you have in your attic. Wurlitzer type. T. E. Champion, 669 Swan St., Terre Haute, Ind.

FOR SALE — TV pix tubes: 10BP4A, 16RP4, 16FP4; 12LP4 and 5" scope tube; amplifiers; AM-FM tuners; PA system, yokes, focus xformers, flybacks, etc. What do you need? J. N. Lemos, 23 Second St., Harrison, N. Y.

FOR SALE — Premier 570 AM sig. gen., fundamental to 50 mc.; Electronic Designs model 100 VTVM. Prefer local. Theodore Popel, 1223 Elm Ave., Brooklyn 30, N. Y.

FOR SALE — Bendix trans. TA 12-D with power supply, 24 v. DC; W.E. audiometer 6-B; Can. Marc. freq. meter, type C-2; Sig. Corps power supply, 400 to 200. S. R. Feller, 3109 Brighton 7th St., Brooklyn, N. Y.

SELL OR TRADE — 20 misc size brand name TV sets, must be picked up. Morgenson, 2541 W. 118th St., Chicago, Ill.

FOR SALE — Multi-Elmac amateur rcvr, model PMR-6A, like new, $100. Want copy of QST for Feb., 1953, must be like new. Advise price. A. J. Barclay, 110 So. Albany Ave., Tampa 6, Fla.

WANT — Converted BC-645 or other equip., licensed or approved for license by FCC, to operate in 460-470 mc. citizen band; also FCC approved circuit conversion diagram for BC-645-A. R. P. Phillips, 604 Mills Ave., Pensacola, Fla.

FOR SALE — Model 177B Signal Corps portable 110 v. AC GM tube tester, electrically identical with new Hickok, $32.50; MX949 A/U portable tube adapter kits, $7.50; Clough-Brengle emission tester, $15. M. R. Longley, 9½ Elm St., Concord, N. H.

SELL OR SWAP — Precision E-200 sig. gen.; McMurdo-Silver 909 sweep gen.; Eico 315 deluxe sig. gen. Need Hi-Fi equip., tape recorder. Control TV and Radio Service, 123 Ave. "U", Brooklyn, N. Y.

WANTED — Shut-in desires AM signal generator and radio service equipment. Must be reasonable. Sam Hardeman, Pine Bluff State Hospital, Salisbury, Md.

FOR SALE — 3-University PH trumpets with line xformers; 3-SAH driver units; U9S Turner mike; 30 w. Clarion amplifier with Monitor speaker. Best offer, all or part. Edwin M. Salkeld, 56 Main St., Perry, Ohio.

FOR SALE — Pentron X-302 reel adapter for 10½" recording reels, slightly used, $22.50 list, FOB $12. Not for uni-lever machines. Instructions and diagrams. D. L. Bichler, 3011 Edwin Ave., Fort Lee, N. J.

FOR SALE — BT1 Astatic booster; Alliance model AB booster. Best offer. Want Police Alarm radio. Botbyl Radio Shop, 1009 Sophia St., Muskegon, Mich.

FOR SALE — Philco tubes in orig. cartons. Guarantee expired, 60% off list: 2-7A4, 3-7A8, 2-7C7, 2-7E6 and 7, 2-7F7 and 8, others, send for list. F. Kirtlan, 560 Pala Way, Sacramento, Calif.

WANTED — An old magazine called "150 Radio Hook-Ups" put out by the "E. I." Co., in the 1920's. George H. Tasker, PO Box 264, Wakefield, Mass.

SWAP — 20 ga. dbl. bbl. L. C. Smith shotgun for A-54H Elmac; also S & W Masterpiece 38 spl. for Millen grid dip meter. C. R. Faulkner, Somerset, Ky.

INSTRUCTION — Free courses in radio and TV service will be offered by the Queens Evening Trade School, 47th Ave. and 37th St., Long Island City, N. Y. Registration for all classes will take place at the school Sept. 10 and 11, from 7 to 9 p.m.

FOR SALE — Lester converter, with all coils; complete mobile xmitter, including Gonset Super Six. All or part for best offer. Want for cash, Viking VFO, National xtal calibrator. Norman Inventasch, 320 East 176 St., New York 57, N. Y.

FOR SALE — Three 0-1 M.A. meters, 4½" square Bakelite case, 50 - ohm internal resistance, VOM scale, alnica magnet, $5 each postpaid. L. Cohen, 151-09-34th Ave., Flushing 54, N. Y.

WANTED — Orig. schematic on BC-929 radar scope or TM or readable conversion instructions on complete conversion of scope for cash. V. Peters, 231 W. 69th St., New York 23, N. Y.

WANTED — Persons who have fun listening to far-away broadcast stations, write me and compare stations we each have heard. John R. Willis, Passaic Ave., Caldwell, N. J.

WANTED — Coils for National HRO rcvr, manufactured about 1940, range 1.8 to 30 mcs. R. F. Van Wickle, 6644 Santa Monica Blvd., Hollywood 38, Calif.

SELL OR TRADE — Eico 630 cathode ray tube checker, $15; EMC model 447NS VOM, $10, both exc. condition. Want flyback tester or Sams photofacts. H. Sievers, 7818 Kipling Pkwy., Washington 28, D. C.

WANTED TO BUY — Tube tester. State make, age, condition, price. Starrow Radio Service, Rt. 1, Interlochen, Mich.

WANT — Ivory cabinet for Emerson radio model 653; UHF converter for Motorola 20K3. Ben's Radio, Nash Road, North Tonawanda 2, N. Y.

SELL OR TRADE — Magnavox 12½" TV table model; Underwood No. 4 typewriter. Want pair handy talkies. A. Schrier, 38 West 182nd St., Bronx 53, N. Y.

SWAP — Kansas City Specialty Co. foundry furnace, model 353 with blower mixer, sand, crucibles, and 3 frames to make molds, for ham xmitter. Hobson Arnold, 783 Essie Ave., Atlanta 16, Ga.

SELL OR SWAP — Two BC-222 xmitter-receiver units, 28-52 mc., with handsets and batteries; also 723 A/B tube. Want communications rcvr, 35 mm camera. Cyril G. Brennan, 2775 Fairmont Road, Montgomery 6, Ala.

SELL OR SWAP — Mobile xmitter, 50 w., dash mounted, 10 meters, commercial; sig. gen.; antenna rotator; Bogen intercom; small Masco PA. Need tape recorder, ham receiver, test instruments, camera and enlarger. David Siegel, 130-18 223rd St., Laurelton 13, N. Y.

FOR SALE — Eico 425 scope, $40; 315 sig. gen., $30; 360 sweep gen., $30; 221 VTVM, l. n., $25; 10-meter beam with 75' of voax, $20; mobile rig, $75. A. L. Jeffrey, 1321 Brinton Rd., Pittsburgh 21, Pa.

FOR SALE — Hallicrafters S-77A comm. receiver, used slightly, like new. J. Michael, 1215 Wheeler Ave., New York 72, N. Y.

WANTED — Meissner 24V sound strip from TV set. Henry I. Griffiths, 39-82 65 Place, Woodside 77, L. I., N. Y.

FOR SALE — Unused FM tuner, needs alignment, 6 tubes, A.F.C., $25. Will ship. Robert Archer, 65 Bay 32nd St., Brooklyn 14, N. Y.

WANTED — BC-221's. Highest cash price for unaltered models with modulation and with orig. calibration books, or those minus modulation accepted. Write or wire Weston Laboratories, Bolton, Mass.

FOR SALE — "Rapid Radio Repair" by Burke, $.50; "Radio Servicing Course Book," Supreme Pub., $1.50; "Understanding Radio" by Watson, $1; "TV Simplified," Kiver, $2; "TV and FM Receiver Servicing," Kiver, $1.50; "Electric Motor Repair" Rosenberg, $1.50. S. Cutler, 1954 Unionport Rd., New York 62, N. Y.

WANTED — UHF Standard coil strips 36-F, K, Q, R and H, or 36 Zenith strips. Will pay $3. Bryan Service, 5346 Delor, St. Louis 9, Mo.

WANTED — Edison phonograph using cylinder records. State condition and price. Melvin Jordan, 808 Lafayette Ave., Mattoon, Ill.

FOR SALE — Unused 1/3 hp 3/8" electric drill; Heath grid dip meter; 300 78 rpm phono records; RCA 10" TV and TV antennas. E. G. Bartlett, Atlanta, Mo.

FOR SALE — 75 w. novice xmtr. (6146) with 200 ma. meter, $20; Heathkit VFO, $18; Pentron 2-way recording unit, without amp., $12. Send stamp for list of surplus bargains. J. G. David, Box 205, Bishopville, S. C.

FOR SALE — Vox record DL-180 with booklet "Spotlight on Percussion," l. n., best offer. Roger Shaw, Box 802, New Bedford, Mass.

FOR SALE — LM-10 freq. meter, like new, xformer type AC power supply built on back of case, 125 kc. to 20,000 kc., with orig. instruction and calibration book, $80. Russell C. Friend, 5355 North Clovis Ave., Clovis, Calif.

FOR SALE — Precision E-200C sig. gen., with instructions book, used once, $50 FOB. Robert W. Huth, 1286 Thomas Ave., San Francisco 24, Calif.

FOR SALE — Philco broadcast receiver, $12.50 FOB. William Parker, Milner Hotel, Huntington, W. Va.

FOR SALE — 6 v. Delco push-button auto radio, 6 tubes, like new, $30; 1/3 hp. 110 v. AC motor, l. n., $15, or trade for tube tester or Riders. John Laflie, 6146 So. Kenneth Ave., Chicago 29, Ill.

FOR SALE — Back number magazines; Radio Physics course, Modern Radio Servicing, by Ghirardi; Zenith, RCA, Silvertone manuals and other radio books. Aubrey Egerton, 407 East 9th Ave., Houston 7, Tex.

POSITION WANTED — by young man 28 years old with 1st class radiotelephone license, in communications or electronics. Troy D. Spencer, Bassett, Va.

FOR SALE — Hi-Fi main amplifier, Espey tube tester, RCA AM-FM radio with 45 rpm changer, dual turntables 3-speed, Jensen matching xformers for speaker-to-line matching. All exc. shape. Stan Lawson, 1605 Spurgeon St., Santa Ana, Calif.

WANTED — Radio and clock for '53 Plymouth, need not be in working cond., for cash or trade sig. tracer, tube tester, and other electronic instruments. Obern Vanover, Wise, Va.

FOR SALE OR TRADE — Complete mobile station: PE-103A, Stancor 203A, Morrow 2BR rcvr, Master antenna coil, Flexor whip, push-to-talk mike, $60 or SX-28 rcvr. Dale Wallace, Box 11, Mentone, Ind.

FOR SALE — Golde 300 w. blower cooled slide projector with automatic slide changer and 7 mags, $40, or part payment for Viking. G. Victor Wintriss, 409 Clairmont Dr., Pensacola, Fla.

SELL OR TRADE — Weston 772 VOM for transistor radio or make cash offer. M. Katz, 147-11 76th Ave., Flushing 67, N. Y.

SELL OR TRADE — 16" 2-speed Federal disc recorder, overhead cutter, needs head, 2 mike inputs, VU-meter, built-in AM tuner, extension spkr. Want HO train equip., photo equip. Louis S. Venturelli, 224½ 21st St., Brooklyn, N. Y.

WANT — Pocket tape recorder; also, pocket radio. Have Nash car radio, $10 FOB; Remington portable typewriter; "your name" rubber stamp, $2. Mitchell Metzarek, 2174 Melvina Ave., Chicago 39, Ill.

SELL — "Principles of Transistor Circuits," R. F. Shea, $7; "Radio and TV Receiver Circuitry and Operation," Ghirardi, $4.50 (or swap for sig. tracer); Coastwise Electronics TV Remote Control, $10. OK Electronics, 447 W. Genesee, Syracuse 4, N. Y.

WANTED — Oscilloscope with triggered sweep. Have RA-38 pwr supply, 0-15 kv, approx. 1 amp. Bob Frazer, 978 Kent St., Altadena, Calif.

SELL OR TRADE — Cascode TV tuner, VTVM, $15; BC-412B, 14BP4, $10; S-38 Dyna Jet engine; Philco portable radio; 100TH; Circuit Anal., amateur handbook, Basic Radio, Interior Electric Wiring, $1 each; Elements of Radio, TV Simplified, Essentials of Radio, $2 each. J. Morfchak, R. 4, Lapeer, Mich.

TRADE — Lord Elgin 21-jewel wrist watch and Remington office typewriter, for clean amateur radio rcvr (not surplus). Trade '46 Chev. sedan for local AC generator. K. H. Stello, 4504 Hartwick Rd., College Park, Md.

FOR SALE — All Eico: 425 scope, $35; 360 sweep gen. and 2 marker xtals, $35; 315 sig. gen., $30; 221 VTVM and HV probe, $25. All like new and used very little. Richard Hennis, 5129 West 30th St., Little Rock, Ark.

FOR SALE — Two 10 w. audio amplifiers, $10, $15; Cinaudagraph spkr 5x7, $2; C-2 Quietone noise filter IF-11, $3; 0-1 ma. DC milliampmeter in case, $4; signal tracer, $9. Maurice C. Superville, 4614 Huisache St., Bellaire, Tex.

FOR SALE — Antique 5" Andrea pre-World War II TV set (table model, channels 2 and 4), working cond. Make offer. I. Horowitz, 1775 East 17th St., Brooklyn 29, N. Y.

SWAP — All kinds of old test equip. Buy all kinds of old radio parts, catalogs, mags., etc. Morgan's Radio & TV, 545 Florida Ave., Jacksonville, Fla.

WANTED — Schematic for Stromberg-Carlson audio amplifier code 30, chassis 300318, made by Templetone Mfg. Co.; two 30 w. P.M. driver units with trumpets. John Arnold, PO Box 84, Bluffs, Ill.

SELL OR TRADE — Speco sig. tracer with probe, used very little, $10 cash or ?? John J. Conroy, 112 Nicholson Rd., Collingswood, N. J.

WANT — NRI model 88 sig.; Feiler scope; Sylvania polymeter; Hickok tube tester, model 547; Hickok TV sig. marker, 610A. Travis Heard, 10260 Oakland, Detroit 11, Mich.

FOR SALE — General Radio variac 1 amp. 5CP4 CRT and xformer for scope. Will take photo equip. on trade. V. Stella, 429 E. 147th St., Bronx 55, N. Y.

WANTED — 144 mc "Handy Talkie" transceiver that appeared in old issue of R.A. Handbook, also in Vol. 4 of Hints and Kinks. In working order. Art Stauch, 541 Princeton Rd., Linden, N. J.

SELL OR TRADE — Navy UHF sig. gen., model LAE-1, 520-1300 mc., accuracy ±1%, with complete instruction book, $125, or trade for rcvr or mobile ham gear. S. Consalvo, 4905 Roanne Dr., Washington 21, D. C.

FOR SALE — Masco 25 w. amp., $35; Astatic mike JT 30, $7.50; 2 TZ40 tubes, like new, $6; 4-tube Blonder Tongue TV booster, $12.50. K. L. Wein, 3070 Bainbridge Ave., Bronx 67, N. Y.

FOR SALE — 22 issues Radio World; 14 issues of Radio News, only 6 without covers, others in very good condition. Make offer. J. W. Brodeur, 96 Lyman, Holyoke, Mass.

WANTED — 7" TV. State price and cond. Misc. parts for swap. Ken Rigoni, Box 93, Marion, Iowa.

FOR SALE — SX-25 Hallicrafter comm. receiver with spkr in good working cond. Best offer. D. Landesberg, 179 Marcy Ave., Brooklyn 11, N. Y.

FOR SALE — Edison Amberola model A. Complete with 98 cylinder recordings, cabinet style with inside horn and record storage. Richard Daneker, 316 E. 2nd St., Lansdale, Pa.

FOR SALE — Zenith AC-DC portable radio, model 6-G-601M, good cond., $10 plus express. Albert C. Hart, 207 N. Raymond St., Griffith, Ind.

FOR SALE — Hallicrafters S-20-R like new, $45; BC-453 Q-5er, $8; RME 10 and 6 meter converter, $15; Dumont 148 scope, $10; all with manuals or wiring diagrams. J. R. Esterly, 21114 Westwood Rd., Fairview Park 26, Ohio.

FOR SALE — Riders Radio Troubleshooters manuals, 7 thru 14, $40 plus transportation. Good condition. Wayne Bloss, 4122 Clubview Dr., Cincinnati 9, Ohio.

WANTED — Old diagrams of Spark-Gap xmitters & rcvrs in good shape; also good TG-10 keyer. Have power supply parts for low power to swap. Samuel J. Reed, 2020 E. Turney Ave., Phoenix, Ariz.

WANTED — Schematic for SAR multimeter. Edward Mandich, 306 Chicora St., East McKeesport, Pa.

FOR SALE — Electro-Voice Tenna-Top, model 3010 TV booster; Heathkit linearity pattern generator, model LP-1. Want D104 with grip-to-talk stand. Leo W. Brandt, Houghton Lake Heights, Mich.

WANT — Mobile station, complete or not, commercial preferred. Cash or trade large power supply, xformers & chassis, chrome plated, excellent. George Colacicco, R. 3, Box 400-D, San Jose, Calif.

TRADE OR SELL — Eico 425K scope, never used; Heath V TV, perf. cond.; signal tracer; eliminator; Hickok 530 tube checker, will test up to 7-prong tubes. Sam Berenblum, 417 Greenwich Ave., Greenwich, Conn.

FOR SALE — Like new Simpson model 269 Volt-Ohm-Microammeter with leads and instructions, $60; slightly used Simpson 260 VOM in bakelite case, $30. Prefer local. Leo J. Sartan, 45-43 158th St., Flushing 58, N. Y.

FOR SALE — Hammarlund HQ-140-X with spkr, $200; NC-33, $40; Heathkit Q multiplier, $9; RME DB-23 preselector, $40; Sonar low-pass filter, $9; Johnson signal sentry with tubes, $12; Johnson S.W.R. bridge, $6. Albert Lebel, 50 Walnut Rd., Hamilton, Mass.

FOR SALE — 3-speed phono motors with turntables, $4; Riders 1-5 abridged, 6 to 12, complete, $4.50 each, or make offer; also, 4-tube portable guitar amplifier, also uses crystal mike, $12.50. Harry H. Elrod, 731 Central, Kansas City, Kan.

FOR SALE — 50 used TV sets 7" to 17", from $10 to $50; tubes: 24A, 41, 7W7, 5W4, and 7C5, 25c. Jack Rosenblit, 92 Lawler Rd., W. Hartford, Conn.

FOR SALE — Best offer takes BC-221 modulated, l. n., no calib. book, and perf. Eico tube checker. S. Horowitz, 146-19 61 Rd., Flushing 67, N. Y.

FOR SALE — Instructograph with 10 tapes and oscillator, bought from factory just over a year ago but never used, $30; Hallicrafter S20R in good cond., $30 plus postage. J. DiTucci, 234 Parkway, Rochester 6, N. Y.

WANTED — R5/ARN7 radio compass in any condition, for cash or will swap electronic gear. Rudolph Fannon, 134 Highland St., Marlboro, Mass.

SELL OR TRADE — TV test equip. Have for trade Riders or Sams TV and Radio manuals. Bob TV Service, Ravenna, Neb.

SELL OR TRADE — Hickok VOM and tube tester, Heathkit VOM, 3" Brengle scope, backdated tubes, and mica transmitting condensers, 1000 v. dynamotor. Want Hi-Fi components or 35 mm camera. N. E. Cullinan, 235 Balbo Rd., La Salle, Ill.

FOR SALE — NRI model 88 sig. gen., 170 kc. to 60 mc., $20; NRI model 112 R. C. tester, $25; both with leads and instructions. Charles Sischo, RD 2, Mexico, N. Y.

SWAP — Coyne Radio-TV course, 5 vols.; OB2's, 83V, 17AP4; TV and Radio Repairing (Markus), for legal size (9x15) mimeograph in excellent working order. Eddie L. Williams, 1521 North Sixth Pl., Milwaukee 12, Wis.

FOR SALE — Norelco Protelgram projection unit with tube and high voltage power supply, $15. M. Binder, 1591 Fulton Ave., Bronx, N. Y.

WANTED — 35 mm. silent films, for cash or trade radio, TV, parts, tubes, etc. Vincent Malack, 10530 Edbrooke Ave., Chicago 28, Ill.

FOR SALE — Superior cross-bar generator, like new with instructions and hook-up cable, $28 prepaid insured. L. Mick, 202 N. Peoria Ave., Dixon, Ill.

WANTED — Used tube tester, state make, model & age. Dick Unger, 514 Krumrey St., Plymouth, Wis.

WANTED — Book for NRI tester, battery operated only. Has a battery block, part No. A-B-C-2. Want operating manual only. Carlton Wilson, Gen. Del., Alta Vista, Va.

WANTED — Mechanics Handbook for '50 Dodge. State price and condition. A. Ettinger, 2314 Pitkin Ave., Brooklyn 7, N. Y.

SWAP OR SELL — Mobile xmitter, 50 w., 10 meters, commercial; RCA portable scope; Bogen intercom; Masco small PA system. Need tape recorder, power tools, receiver. Bob Seigel, 130-18 223rd St., Springfield Gardens 13, N. Y.

TRADE OR SELL — 12" Zenith console with new pix tube. Want tape recorder or AM-FM tuner, or scope. Murray Schiffman, 75-40 Austin St., Forest Hills 75, N. Y.

FOR SALE — Eico deluxe 147 sig. tracer with wattmeter, $30; Eico VTVM 221, $30; Superior TC-55 tube tester, $23; Jackson 640 test oscillator, $20. Herbert Armstrong, 1800 Bristol, Kansas City 26, Mo.

WANT — Hickok model 533AP tube tester in new condition, and other Hickok test equip. Paul Capito, 637 W. 21st St., Erie, Pa.

FOR SALE — Heath OL-1 3" oscilloscope, A-1 cond., $35; Heath sig. gen., SG-8, with instructions, l. n., $22, plus postage. T. E. Shaw, 3-20 27 Ave., Astoria, L. I., N. Y.

SWAP — 3" Pilot in good working order, for 8 mm. turret camera and projector in good working order. Charles Schneider, 1455 Grand Concourse, Bronx 52, N. Y.

FOR SALE — 179 tubes from 1A7 to 45's, in sealed cartons; list at $416.65, will sell for $100, guaranteed, prepaid. Sherman Radio Shop, 1205 W. 21st St., Sioux Falls, S. D.

FOR SALE — 25,000 renewable fuse-links for 250 v. cartridge fuses: 10A, 15A, 20A, 25A, 30A. List value $.02 each; approx. $500 value, close-out for $45, owner retiring. M. Richies, 2111 East 36th St., Brooklyn 34, N. Y.

WANTED — For cash, binders any quantity suitable for CQ, QST, Photofacts; Riders radio manuals, original singles with indexes, Vols. 1 to 5. Give details. Frank Odziana, 18456 Gable St., Detroit 34, Mich.

TRADE — Howard 7-tube and Hallicrafters S40-A 9-tube comm. receivers, both in good working cond. Want tube tester, VOM, VTVM. Local only. Max Reiter, 2531 E. 19th St., Brooklyn 35, N. Y.

TRADE — Portable electric phono and large picnic ice chest, for VTVM, scope, sig. generator, or pocket voltohmeter. M. Kleinberg, 827 Hunts Point Ave., Bronx 59, N. Y.

WANTED — Portable leatherette case for 7" Motorola, mod. VT73. State price and condition. Wilbur Remley, R. 6, Box 370, Decatur, Ill.

SELL OR SWAP — Knight "Ocean Hopper" receiver, model 740, with 3" speaker and 6 coils (150 kc., 35 mc.) mounted on front panel frame. Julian Sher, 160 Central Ave., Chelsea 50, Mass.

SELL OR SWAP — Eico 320 sig. gen.; Heathkit signal tracer model T-3. Need 6-meter equipment: parts, tubes, mobile gear any band. Robert May, 203½ Althea St., Providence 9, R. I.

WANTED — Book that gives all information required in reading radio diagrams. Wayne Sines, R. 1, Box 425, Oakland, Md.

SWAP — Hunting and fishing equip., for Heath battery eliminator, dot generator, condenser checker. Alfred Consiglio, 4615 Furman Ave., Bronx 70, N. Y.

FOR SALE — SG-6 sig. gen.; multimeter; T-2 sig. tracer; 3" portable scope; lab power supply; "Radio & TV Math." Stanley Bombka, 8107 N. Odell Ave., Niles, Ill.

SWAP — Precision, series 80, multitester, plus Eico bar gen., both in perfect condition with operating instructions, for a scope in good cond. James P. Torre, 101-48 120th St., Richmond Hill 19, N. Y.

FOR SALE — RMS BAR-1 bar generator, $6; Alliance AB-3 TV booster, $6; Knight in-circuit capacitor checker, $12. All like new, postpaid. Evans Taylor, Jr., 905 Lowden St., Malvern, Ark.

WANT — Hallicrafters or National rcvr, like SX-42 or 43, anything over 1948, will pay $100. Norman Webb, 15 W. Main St., Holcomb, N. Y.

FOR SALE — Argos tube caddy and Phaostron multimeter, l. n.; TV hand tools; Sylvania tube manual; Gernsback library; 105 lesson Devry Tech. Inst. course; trade papers for last few years. R. H. Stillwell, RFD 2, Brunswick, Me.

FOR SALE — Tube tester, VTVM, signal generator, tubes, condensers, resistors, controls, Sams, only $300. Arnold Vernoy, RFD 2, So. Woods Dr., Monticello, N. Y.

FOR SALE — Oak Ridge TV sig. gen., model 103, $9.50; Do-All TV Generator, model 704A, signal, marker, and pattern generator, vert. and horz., $35; G. E. sig. gen. YGS-3, 100 kc., 150 mc. in 7 bands, built-in crystal calibrator, like new, $75. All prices plus shipping. H. M. Love, 20108 Detroit Rd., Rocky River, Ohio.

FOR SALE — Stanley portable electric hand drill. Has Jacobs key chuck for up to ¼" drill, exc. cond., $16. Daves Radio, 1316 42nd St., Brooklyn 19, N. Y.

WANTED — First video I.F. xformer for RCA 8T241 10" TV, chassis KCS 28-1, tran. part 73571, new or used. Fritz's Radio Service, Rt. 3, Gallion St., Tyle, Tex.

WANTED — Hi-Freq. version of BC-221 such as TS-323-UR. Mention price and condition. R. Kulmus, Westmoreland Rd., RD, Whitesboro, N. Y.

WANTED — ARC3, ART13, BC-788C, BC-348, BC-312, ARC1 gear and all types tech. manuals. Swap receivers, i.e., NC300, HRO. George J. Pasquale, 9421 Thornhill Rd., Silver Spring, Md.

SWAP — 3 ant. rotors complete, 3-speed phono cartridge, meters, motors transformers. Need VTVM, cond. testers, sig. tracer, transistors, Navy ARB receiver. Thomas Rohland, RR. 3, Martinsville, Ind.

FOR SALE — G. I. recorder and playback mechanism, less amp.; 15" H.F. spkr.; p.m.; matched power and output transformers, 78 rpm turntable; and FM tuner, $50 for the lot. Arthur Blauvelt, 462 Walnut St., Newtonville 60, Mass.

FOR SALE — Radio-TV Service shop, 14x38', including 50x210' lot, all necessary equip., and teach you to service radio and TV, $2,000. All inquiries answered. Emanuel F. Cox, Box 383, Caraway, Ark.

SWAP — Overstocked radio tubes in cartons, for other tubes. Send for list. What have you? Madlinger's Television Service, 478 Woodward Ave., Brooklyn 37, N. Y.

FOR SALE — Amprobe, model A6, ranges: 0-150, 600 v.; 0-10, 25, 50, 100, 250 amps., with leather carrying case, $25. Also have 3FP7 indicator tube. William Hintz, Box 243, Hopkins, Minn.

SELL OR TRADE — Hickok 550X dynamic mutual conductance tube tester with built-in multimeter, portable case, good cond., $60 postpaid, or Acrosound TO-340 or 350 in perf. cond. R. C. Robinson, 1814 Robin Rd., N. Augusta, S. C.

FOR SALE — EMC model 106 VTVM, like new, $18; NRI electronic multitester VTVM, like new, $10. Cecil R. Wallace, R. 1, Albertville, Ala.

FOR SALE — Bandswitching transmitter, 120 w. phone, 180 w. CW, no TVI, all stages metered, built-in power supplies and VFO, key click filter, red and green signal lights, Viking match-box included, no shipping, $175. Frank A. Walker, 10015 Yale Ave., Chicago 28, Ill.

FOR SALE — Power transformers: grade 1, class A 115 v., 6 cy. input; 950 v. 250 ma., 5 v. 3A, 900 v., 150 ma., 6.3 v. 6A, 6.3 v. 2A, secondaries, $60 each. R. Hallock, 2538 South Highland Avenue, Los Angeles 16, Calif.

FOR SALE — Eico VTVM 221; Precision sig. tracer 201, both in exc. cond., $30. Landry's Radio Shop, 2524 Frenchmen St., New Orleans 16, La.

FOR SALE — Raytheon voltage stabilizer transformer, input 90-130 v. AC, output 115 v. AC, 500 w., $50; Simpson 260 VOM meter, $20; Variac 6-amp., $7; Signal Corps rcvr BC-464-C, $15. C. E. Steelman, 1040 So. Worth St., Indianapolis 21, Ind.

TRADE — Large stock of 1% resistors for what have you? Larry Critchlow, Pearl River TV, 55 E. Central Ave., Pearl River, N. Y.

SELL OR TRADE — Complete up-to-date Radio-TV course (includes color), 118 lessons plus 18 lessons in math., exc. cond., $40. W. B. Jones TV and Radio Service, Carnesville, Ga.

WANTED — BC-474A radio xmitter-rcvr, and instruction book. State cond., price, and whether any spare parts available. Harold Weinfeld, 2075 Wallace Ave., New York 62, N. Y.

SELL OR SWAP — RCA voltohmyst Jr. with test leads; 1 vol. Linguaphone Morse Code records; RF meter. All 1. n. Want good tape recorder. R. Hyatt, 478 Troy-Schenectady Rd., Latham, N. Y.

SWAP OR SELL — 5 United xformer type 0-14; 3 type 0-15 ounce audio units, all for $20, or for two dozen RCA 5823 gas tubes. G. Kusse, Hays Corp., Michigan City, Ind.

FOR SALE — Fentone Brenell tape deck, matching PRO-2 preamp., 3 speeds, VU meter; Jensen TP-200 3-way spkr system; Fairchild 215A cartridge, matching step-up xformer. Send for complete details. Gary Feld, 238 Naples Terr., Bronx 63, N. Y.

SELL OR TRADE — German 3¼ x 4¼ view camera, complete, Graflex back; Zenith 20J21 TV chassis, and boosters; auto and home radios; WV65A RCA battery-voltomyst. Want Precision E200-C gen., 8 mm movie projector. Chester Benson, 311 So. 5th St., Richmond, Ind.

FOR SALE — Magnetic jig saw, $7.50; electric meters $1.50 and up. James Fred, 1511 Terrace Lane, South Bend 15, Ind.

FOR SALE — Model U-239 Ferret Geiger counter, best offer. Bob Reynolds, 3824 So. 40th, Lincoln, Neb.

WANTED — FM tuner, in good cond., New York City area. Herman Grohman, 211 Bedford Park Blvd., New York 58, N. Y.

FOR SALE — Hickok RF05 oscillograph, $45; tubes 6AB7, 6AC7, 2A3, $.50 each. C. Benedetto, 1723 Mansion St., Bronx, N. Y.

WANTED — Special purpose, receiving and xmitting tubes. Cash or swap. William Schechter, 62 Cortlandt St., New York 7, N. Y.

BUSINESS FOR SALE — Well-established retail business in center of Stamford, appliances, TV, Hi-Fi, repairs, modern store, exc. money-making opportunity, reasonable. PO Box 611, Stamford, Conn.

SELL OR TRADE — Ansley 18-tube, Hi-Fi, 3 bands, short wave, AM-FM, 12" coax. spkr., perf. $45, or trade for B.C. radio or other comm. rcvr. R. Garcia, 300 W. 17th St., New York, N. Y.

FOR SALE — Hammarlund HQ-120 rcvr, exc. cond.; Navy xmitter TCS-5, 40 w. CW, 20 w. fone, 40 x 80 meter bands, built-in VFO and antenna tunings with manual, power supply, $150. Edward L. Whitten, 109 Arnold St., Revere, Mass.

FOR SALE — Hallicrafter model 47 with 12" GE coax. spkr mounted in big cabinet, $100. T. C. Albright, 7 Oakwood Ct., Tuscaloosa, Ala.

WANTED FOR CASH — Sams Photofact folder sets 228 and 229 and 231-249. State cond. and price. Earl W. Wells, 223 N. Philadelphia St., Shawnee, Okla.

FOR SALE — Gonset 6-meter communicator 6/115 v. with mike, antenna and crystal, exc. cond., $199; T32 push-to-talk desk mike with coil cord, $9.50; T17 mike with coil cord, $5.50. T. S. Grove, Box 50, Factoryville, Pa.

FOR SALE — Collector's item: RCA Radiola 18, model AR 936. Sold as is. Make offer, money to go in club general fund. Lansingburgh Boys' Club, Inc., Thomas F. Rafferty, Jr., 585 Second Ave., Troy, N. Y.

FOR SALE — Closing successful Radio-TV-Appliance service business. Will sell at real deal and help you get acquainted, fine community, excellent business, great climate. Jack Arundel, 124 13th St., West Sacramento, Calif.

FOR SALE — A-200 A.E.I. sig. gen., exc. cond., 100 kc to 75 mc. in 8 bands, complete, cost $49.50, make offer. Also Radiation loop and align. wand, A-1 cond., $8. Edward H. Svoboda, R. 1, Box 160, Wilber, Neb.

WANTED — Operating instructions and manual for McMurdo-Silver sig. tracer, model 905. Need urgently. W. L. Gladden, Jewelers Service Co., 108 W. Fayette St., Baltimore 1, Md.

SELL OR SWAP — H.F. rec., 400 kc. to 30 mc.; AC VTVM; 7" scope; 2IZP4A and 17JP4 pix tubes. Want 25 to 30 hp outboard motor in any shape if all in one piece. G. B. Amey, 968 N. Market St., Williamsport, Pa.

FOR SALE — Components for 1½ kw plate supply, $75; 20M rotary beam, prop pitch motor, $30 (will not ship); converted BC-457A-458 transmitters, no power supply, $15 each. Joe Tucker, 866 East 48th St., Brooklyn 3, N. Y.

FOR SALE — Heathkit TV align. generator TS-1A, $15; Vomax 900 VTVM, $25; Riders TV manuals 1 thru 12, like new, with index, $14 per volume. Free Riders Vol. 23 with complete set. M. Raffer, 485 E. 42nd St., Brooklyn 3, N. Y.

SELL OR TRADE — Sonar VHF xmitter and rcvr, complete with 6 v. power supply, and spkr, unused. Want VTVM all-purpose meter. LiCalzi Air Service, Bridgeton, N. J.

FOR SALE — S-20-R Sky Champion rcvr, good cond., $35; GI disc recorder with 12 w. P.P. amp., xtal and magnetic cutter, chip chaser in case, $30; Riders Vol. 6 and 7, l. n. W. Gieckel, 22-43 35th St., Astoria, L. I., N. Y.

SELL OR TRADE — Dormitzer electronic flash unit M100, wet-cell or AC-operated, charger included, black and white guide number 160, flash duration 1/5000 sec. Want scope or 8 mm. movie camera. R. Rudofsky, 225 Park Pl., Brooklyn 38, N. Y.

WANTED — Hickok 600A tube tester or equiv., and regulated power supply 6-12 v. DC with volt and amp. meter. Virgil Franceschini, 708 Bigler Ave., Barnesboro, Pa.

FOR SALE — 6J6 tubes, 35c each; 3 General Radio pots, type 371A, 50,000 ohms, $5; 5 condensers, 4 mtd, 150 v. AC, 800 cy., $5. M. Levine, 2244 East 27th St., Brooklyn 29, N. Y.

FOR SALE — Three-tube Ocean Hopper rcvr, exc. cond., and coils for 2.5 - 7.0 mc. and 530-1700 kc., $10; 90 feet No. 22 aerial wire, $1. Irvin Grogan, 2736 Reynolda Rd., Winston-Salem, N. C.

SELL OR TRADE — Complete DeVry Radio and TV course, including kits, 2½ yrs. old, cost over $300. Make offer, or trade for shop tools. R. A. Spanjer, Box 485, Quincy, Wash.

SELL OR TRADE — Test equip., reference books and stock, entire lot only, cannot ship, cheap for cash or trade for power saw. Mart's Radio Service, PO Box 107, Pentwater, Mich.

FOR SALE — Regency boosters, model DB-410; UHF Regency conv., model RC-53; Mascode automatic all chan. booster, model ABV; O.F.D. (Chan. 12) Tuckaway booster, model VB. Make offer. P. Tennyson, 37 West Washington Street, Nanticoke, Pa.

FOR SALE — Weston 669 VTVM, 1.2, 3, 6, 8, 12, 16 volts, $10; 4 GR attenuators 600/600 ohms, 15 steps at 0.5 db step, $4 each FOB. Emil Backstrom, Jr., 6 Pel Pl., Pelham, N. Y.

WANTED — Hickok 288X, or equiv. AM-FM sweep gen. State cond. and cash price. Have wire recorder operating on 6 v. storage battery for sale or swap. Karl Neuwirth, 16 May Pl., Nutley 10, N. J.

FOR SALE — RME 45 rcvr with spkr, $90; Electro-Voice model 3000 TV booster, $25; 814 tubes $5 each. Dave Schmidtke, Route 1, Faribault, Minn.

FOR SALE — Riders Vols. 6-13 and 15 in A-1 cond., $45 plus express charge, or trade for scope or other test equip. R. C. Nelson, Radio and TV, Newark, Mo.

FOR SALE — Webcor Hi-Fi 2030-1A tape recorder, 3 spkrs, 2 speeds, $100; Bogen H30 Hi-Fi 30 w. amplifier, 2 mikes, 1 phono input, 4, 8, 16, 500 ohm and 70 v. output, $75. Paul Conteas, 432 Pearl St., New York, N. Y.

FOR SALE — Two 813 tubes, $6.50 each; four 50 w., 1000 ohm potentiometers, $6; 3000 v. C.T. 300 ma., plate transformer UTC S-47, $12.50. Libby's, 126 Bennett St., Port Richmond, Staten Island, N. Y.

WANTED — Single speed 3¾" sec. Crescent tape recorder, must be a bargain. L. Woodall, 3811 Dempster Ave., Dallas 11, Tex.

SELL OR SWAP — Rolleicord V, Rolleikin 35, 2-lite strobe, 5x7, complete accessories and darkroom; SW-54, $25; AT-1 $20; AC-1 $7; S-40 $60; 100 w. 160 thru 20 fone rig with 3 power supply, $90. Want DX-100, 20A, etc. R. Rush, 320 Greenwood, Greencastle, Ind.

FOR SALE — 194 QSTs 1931-1950 inc., almost 100% thru 1941. Best offer for lot or singly. Gene Rider, 1810 Alamanda Dr., N. Miami, Fla.

FOR SALE — Eico 625 tube tester, l. n., $25; Heathkit condenser tester, exc., $15; antique Jewell tube tester, works off batteries. Best offer. R. W. Foulkes, 727 La Prairie Ave., Ferndale 20, Mich.

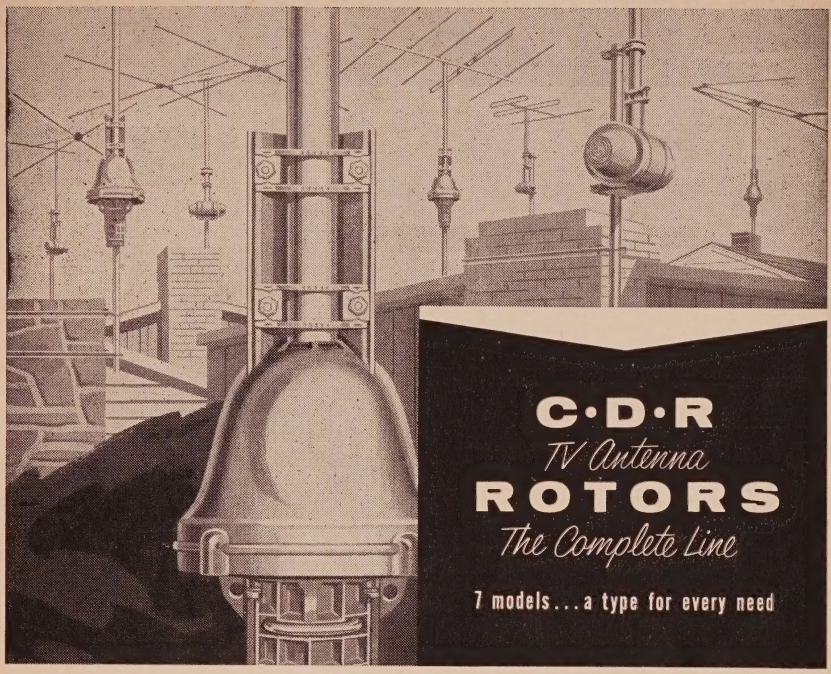
FOR SALE — 164E Dumont scope, l. n., $50; 773-2nd conversion Weston tube tester, good cond., $20; "Recording and Reproduction of Sound" by Oliver Read, $2; Riders record changer manual, $3; UTC CGE-1 equalizer, $10. Paul Curtis, Box 266, Enterprise, Ore.

FOR SALE — Sylvania tube tender, like new, $7. New York City area only. Julio Bellber, 503 W. 174th St., New York 33, N. Y.

FOR SALE — Webcor 210-1C tape recorder with 1200 ft. tape and take-up reel, in perf. cond. Solid on $125, FOB Brooklyn. Spencer Dubov, 3100 Brighton 2nd St., Brooklyn 35, N. Y.

FOR SALE — RCA Jr. voltohmyst WV-77A, like new, complete with cables, manual, HV 30KV probe and AC-DC switching probe. Best offer. Reiney's Radio & TV, 5225 Proctor St., Port Arthur, Tex.

SELL OR SWAP — 3" Pilot TV and carrying case, like new, for cash or high-power telescope 100 power or more. Make offer. W. L. Koch, 362 Dorsey St., Cincinnati 10, Ohio.



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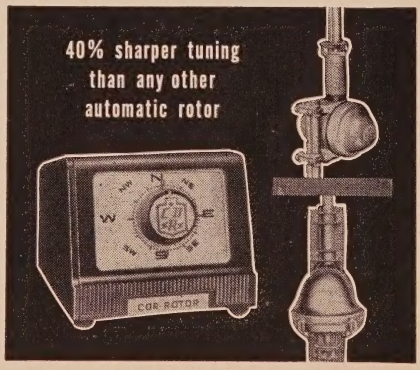

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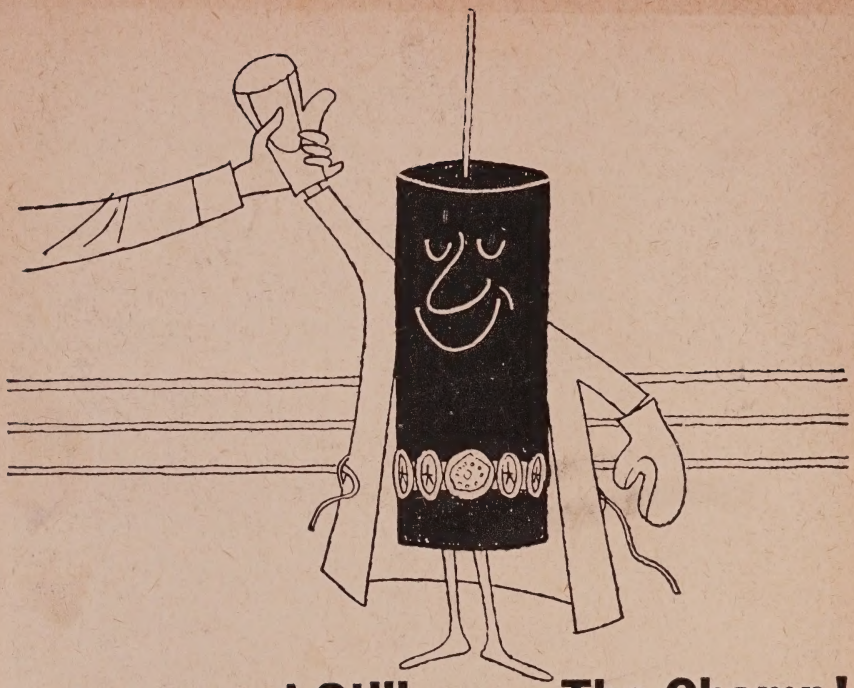

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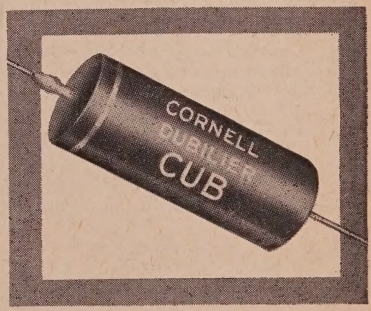

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